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ABSTRACT

This guide is designed to assist teachers and educational administrators to infuse energy education into the public school curriculum. The document is divided into blocks of grade levels: K-3, 4-6, 6-8, 9-12. For each grade level, a matrix is presented in which one axis includes such "people" concerns as: (1) consumer concerns; (2) individual well-being; (3) career; (4) recreation; and (5) socio-legal. The other axis of the matrix includes the learning dimensions of: (1) knowledge; (2) application; and (3) values. The approach to energy education is multidisciplinary and an effort is made to relate the basic information to experiences which students have at various stages of public school education. (RE)

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# TEXAS ENERGY EDUCATION FRAMEWORK

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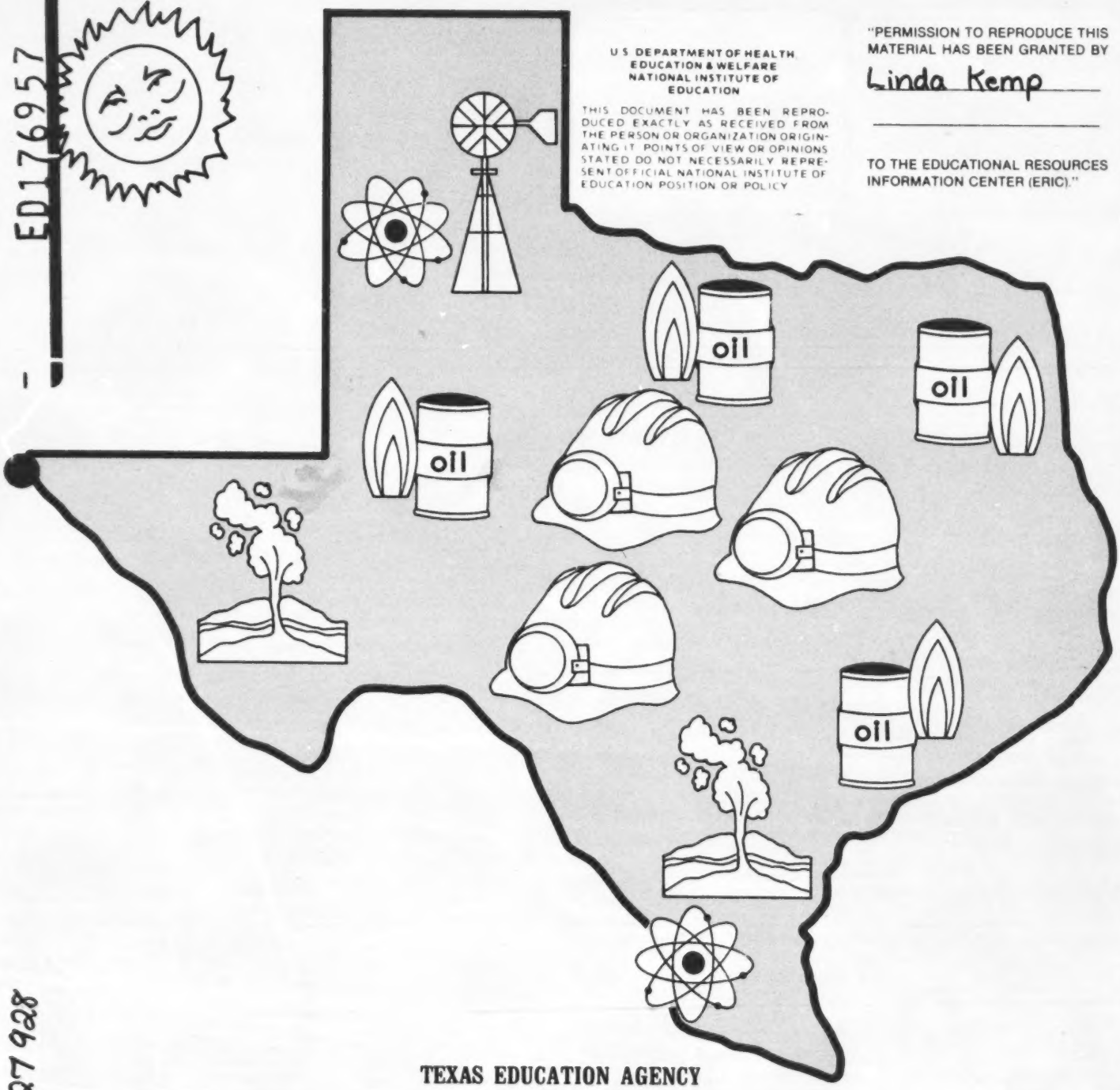


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## FOREWORD

The *Texas Energy Education Framework* is designed to assist teachers, administrators, and other school personnel in the process of infusing energy education concepts into the public school curriculum. The *Framework* focuses on the basic concerns and needs of people as related to energy and suggests ways in which energy conservation can become a meaningful part of all disciplines in elementary and secondary schools.

We hope that the *Framework* will be a useful tool in helping young people become more aware of the critical decisions which we all face in meeting the present and future energy needs of our state and nation. The future of our society will depend in large measure on the thoughtfulness and wisdom of these decisions.

M.L. Brockette
Commissioner of Education

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## RATIONALE

The State of Texas assumes a position of national leadership in agricultural and industrial development. Its bounty of natural resources and variety of terrain and climate attract people from throughout the world. Texas' population is more than double that of the last decade. Texas citizens, like those across the nation, are enjoying the benefits of rapid technological development; life is becoming more comfortable, safe, and rewarding. These are very positive developments in which the people of Texas can take justifiable pride. Hard work and creative thinking, indeed, produce the "good life" in our state. Unfortunately, these same factors of rapid population growth and technological developments result in greater and greater demands on our state and national supply of energy. We are consuming energy faster than the supply is being replenished. The shortage is becoming more critical, and society depends on current and future decisions we make regarding our use of energy resources. Energy conservation is a most critical world, national, state, community, and personal priority.

Few people take issue with the fact that conservation of energy is essential. What is planned, developed, and accomplished in the area of energy conservation is the collective result of the individual efforts of Texas people. One person cannot even address a problem of this magnitude, let alone work out a solution. Each person can only react to the problem as it affects his or her personal life. There are certain basic concerns of people which relate directly to the quality of life they can expect to have. When people realize that the future availability of energy directly affects their personal health, ability to work, and ability to enjoy the fruits of their labor, they begin to take action.

This framework for energy education in Texas schools is designed to address the problem of energy consumption from the standpoint of each individual and to suggest the effect which wise use of energy can have on the quality of life. The basic concerns of all people include personal health and well-being, career choice and development, consumer activity, enjoyment of leisure time, and a satisfying role in society. This framework demonstrates how each person's use of energy directly affects these basic concerns. For example, a diminished supply of energy directly impacts the consumer. The price of gasoline continues to rise, thereby causing each person to spend a greater proportion of personal income on fuel. It also causes local shortages which restrict travel, spoil vacation plans, and even affect employment and home location. There are steps which each person can take to moderate the use of gasoline and therefore avoid family budget problems and inconveniences which a critical shortage would produce. This framework systematically addresses individual problems and focuses on the questions: "How can energy conservation affect me, and how will alternative energy resources affect me in the future?"

An effort is made to relate the basic concerns of people to experiences which they have as elementary school students, middle school students, and young adults in the high school. People of all ages have concerns related to personal health and well-being, career choice or development, recreation, money supply, and social interaction. The framework directs attention to these concerns and to the relationship of individual use of energy. The concepts, applications, and values are outlined in a K-Grade 12 continuum which is designed for infusion into the regular curriculum offerings of the school.

## GOALS

The student will:

- Help to make conservation of energy a national, state, community, and personal priority
- Become aware of one's role as a consumer and conserver of energy
- Be familiar with the various types of energy and how they can be changed from one form to another
- Be familiar with the major career opportunities in the energy field
- Understand the legal/social implications in the production and use of various types of energy
- Understand the environmental and economic impact of the use of energy and the effect which this may have on each person's life style
- Understand the effect of energy production on the Texas economy

## DESCRIPTION OF THE ENERGY EDUCATION MATRIX

The following Energy Education Matrix serves as a basis for formulation of the Texas Energy Education Framework. It is designed to ensure the development of learning activities directly related to the personal concerns of people. The basic concerns of people listed on the horizontal axis are:

- Consumer Behavior
- Personal Health and Well-being
- Career Choice and Development
- Leisure Time and Recreational Activity
- Social-Legal Interaction of People

It is assumed that students will need learning experiences in three basic dimensions which relate energy education to these personal concerns. These dimensions listed on the vertical axis of the Matrix are:

- Knowledge (Concepts)
- Applications of Knowledge (Activities)
- Values and Attitudes

The interaction of the basic concerns of people (horizontal axis) and the dimensions of learning (vertical axis) create 15 instructional development cells. For example, in Cell One, the interaction of personal consumer concern and content knowledge creates a base for design of learning content related to consumer behavior. Such topics as the relationship between energy supply and price, wise shopping for energy-efficient appliances, the effect of energy shortage on the quality of goods and services, the relationship to personal comfort, the cost effectiveness concept, and selection of clothing for different seasons could be developed using this cell as a planning base.

Cell Eight, created by the interaction of educational applications as related to career concerns of people, creates a planning base for student understanding of how changes in energy supply will affect job opportunities in future years. For example, the student will be able to see how new sources of energy such as wind, solar, and geothermal, will offer new career opportunities. Such concepts as the effect of energy shortage on the recreational industry, on new energy forms related to engineering job opportunities, and on applications of solar energy (including opportunities for development of extra-terrestrial collectors) would be included. The career opportunities exploration and selection process will undergo tremendous change in application during the coming years. All phases of curriculum should reflect not only changes in job opportunities but the need for early exploration, planning, and proper training for the world of work in the future. This cell, like all others, is only intended as a springboard in the area of curriculum planning and by no means presents all of the possible applications.

# USE OF ENERGY EDUCATION CHARTS

The following charts present an array of examples delineating the kinds of learning experiences that could be designed using each of the 15 cells as a planning base. The curriculum designer or teacher can, from this kind of base, delineate a multitude of learning activities for each cell as they relate to science and social studies as well as to all other disciplines. The basic concepts and educational programs which follow are all based on the use of this Energy Education Matrix as a planning base. Items included, such as descriptors in the Matrix, are by no means all inclusive but only represent examples of the kinds of learning experiences that can be infused into all phases of the elementary and secondary school curriculum.

# ENERGY EDUCATION MATRIX

| | Consumer | Individual Well-Being | Career | Recreational | Socio-Legal |
|---|---|---|---|---|---|
| **Knowledge** | (1) Knowledge of energy conservation affects consumer behavior. | (2) Individual health and well-being are directly affected by energy use. | (3) Changing patterns of energy use and energy resources affect career opportunities now and in the future. | (4) Energy shortages and changing patterns of use affect the recreational activities of all people. | (5) Changing patterns of energy consumption and energy regulations affect individual lifestyle and the world society. |
| **Application** | (6) Applications of consumer knowledge relate to energy conservation. | (7) Application of energy conservation techniques improves individual health and well-being. | (8) Educational requirements for new jobs resulting from energy conservation and alternative resources are changing rapidly. | (9) Applications of information regarding wise use of energy affect the use of leisure time. | (10) Application of social-legal knowledge related to energy conservation and energy production affects the ability of each individual to live in harmony with other people of the world. |
| **Values** | (11) Consumer values affect the total use of energy. | (12) Personal values related to energy use affect the health and well-being of each individual. | (13) Career values and work ethics relate to the changing energy picture and job satisfaction. | (14) Personal values regarding the use of energy for recreation affect the total consumption of energy. | (15) Social and political values are directly related to availability of energy and influence its research, transportation, and consumption. |

# INTRODUCTION TO MATRICES K-GRADE 3, GRADES 4-6, GRADES 6-8, GRADES 9-12

The need for energy education is critical and should be infused at all instructional levels and in all subjects. Toward this end, matrices of instructional cells for energy education have been developed for Kindergarten through Grade 3, for Grades 4 to 6, for Grades 6 to 8, and for Grades 9 to 12. Although school communities have their own expectations and their own needs, the matrices seek to show common concerns in energy education. *The Framework for Energy Education* aims at infusing the concepts of energy education in the Kindergarten through Grade 12 curricula while enlisting all students and educators in the energy management team.

The matrices on pages 6, 8, 10, and 12 are examples of how the goals for energy education can be expanded to include objectives for classroom activities. The matrices are not comprehensive lists of the knowledge, applications, or values applicable to energy education. The teacher may use the matrices as guides in developing his or her instructional program.

The Energy Education Curriculum Planning Activities on page 7, 9, 11, and 13 illustrate how individual instructional cells of the matrices are applicable to a number of subjects. Teachers are urged to reflect on their instructional sequences and focus appropriate segments on energy education goals.

# GRADES K-3 MATRIX
## OBJECTIVES FOR ENERGY EDUCATION

| | Consumer | Individual Well-Being | Career | Recreational | Socio-Legal |
|---|---|---|---|---|---|
| **Knowledge** | The student will become aware that energy can be changed from one form to another. | The student will be aware of interdependence of energy use and personal comfort. | The student will be cognizant of energy uses in parents' jobs. | The student will be aware that the games we play use energy. | The student will become aware that our homes benefit from energy-efficient decisions. |
| **Application** | The student will be able to dramatize simple energy changes. | The student will recognize conditions which might affect heating and cooling devices. | The student will be aware that the nature of jobs changes with the source of energy used. | The student will be able to compare the relationship between physical motion and body heat. | The student will be aware of classroom rules that regulate classroom uses of energy. |
| **Values** | The student will determine ways to conserve energy at a personal level. | The student will realize one form of energy conservation is as simple as personal selection of clothing for each weather situation. | The student will determine how job choices affect the amount of energy use and how the community is affected. | The student will realize that there can be personal satisfaction in independent play without expending excessive energy. | The student will tolerate some degree of discomfort or loss of independence for the benefit of all. |

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 7.

# GRADES K-3 ENERGY EDUCATION ACTIVITIES

## CAREER APPLICATION

THE STUDENT WILL BE AWARE THAT THE NATURE OF JOBS CHANGES WITH THE SOURCE OF ENERGY USED. The following activities illustrate how one instructional cell of the matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional activities to meet the particular needs of his or her students.

| SUBJECT | CORRELATING ACTIVITIES |
|---|---|
| Language Arts and Social Studies | Students make a list of workers involved in building a house and indicate the use of energy in each of their jobs. |
| Science | Students interview workers who use alternative sources of energy in construction and ask how they increase home energy efficiency by using these different sources of energy. |
| Mathematics | Students compute the number of days different workers spend in building houses using energy-saving methods. |
| Art | Students make a mural showing the workers at various stages of building a house. |
| Music | Students make musical instruments from discarded building materials to develop an awareness of different sources of energy conservation. |
| Health | Students develop a simple dance in which they imitate the workers. |
| Reading | Students read stories related to construction with attention focused on the use of energy in the jobs of the workers. |

# GRADES 4-6 MATRIX
## OBJECTIVES FOR ENERGY EDUCATION

| | Consumer | Individual Well-Being | Career | Recreational | Socio-Legal |
|---|---|---|---|---|---|
| **Knowledge** | The student will be aware that consumer decisions are usually directed by one's particular environment or culture. | The student will be aware that the sufficient supply of energy depends essentially on lifestyles and the wise use of natural resources. | The student will be aware that the field of energy offers major career opportunities and satisfying work experiences. | The student will be aware that the supply of world energy affects the way we use leisure time. | The student will be aware that the supply and use of energy are directly related to the world's economic and political well-being. |
| **Application** | The student will identify the usability span of different types of beverage containers and will recognize the role of energy in recycling. | The student will be aware of wasteful uses of energy at home and at school and will determine measures which increase the sufficient supply of energy. | The student will identify energy related jobs in society today. | The student will evaluate favorite recreational activities and determine the type of energy used. | The student will recognize that supply and use of energy have an impact on the community, state, nation, and world. |
| **Values** | The student will recognize cultural differences in energy use patterns. | The student will recognize how the use of energy affects individual well-being and the fate of generations to come. | The student will be aware of alternative energy resources that could be used to maintain the current lifestyle. | The student will understand how decisions, lifestyle, and leisure time affect energy efficiency. | The student will compare energy uses that are important only for personal comfort or convenience in the home and community. |

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 9.

# GRADES 4-6 ENERGY EDUCATION ACTIVITIES

## INDIVIDUAL WELL-BEING AND KNOWLEDGE

THE STUDENT WILL BE AWARE THAT THE SUFFICIENT SUPPLY OF ENERGY IN THE UNITED STATES DEPENDS ESSENTIALLY ON LIFESTYLES AND THE WISE USE OF NATURAL RESOURCES. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

| SUBJECT | CORRELATING ACTIVITIES |
|---|---|
| Language Arts | The class will compile a newspaper about energy sources and conservation. Include headlines, news stories, feature stories, editorials, letters to the editor, cartoons, and advertisements on energy sources and on how energy could be conserved. The writing of the editorials could be used as a class contest or expanded into a school-wide contest. |
| Spelling | Introduce the spelling of energy related words. Students participate in class or school "spelling bees." |
| Reading | Students write a simple poem about the wise use of energy or about alternative energy sources. Poems are read aloud to the reading group. |
| Mathematics | Students prepare a chart of temperatures in the classroom/school. Chart shows the monthly fuel cost. |
| Science | Students keep records of their use of electricity for one day, noting the purpose of each energy use and the ways energy could be conserved. |
| Social Studies | Students list items available for use in the home which are considered luxury items, convenience items, and necessity items and do a comparative study of costs in terms of energy usage. |
| Art | Students design logos and slogans that will inform people about the need to conserve energy. Students paint a mural using these logos and slogans. After securing permission from local merchants, students reproduce the mural on a store window to further public awareness of need for energy conservation. |
| Music | Students make a class collection of songs related to energy and learn to sing the songs. Using some of the songs they have learned, students write and produce a play to be presented for the student body. |
| Health | Students compare health problems of the United States to those of countries that have less energy available and determine the role of energy in providing good health care. |

# GRADES 6-8 MATRIX
## OBJECTIVES FOR ENERGY EDUCATION

| | Consumer | Individual Well-Being | Career | Recreational | Socio-Legal |
|---|---|---|---|---|---|
| **Knowledge** | The student will be aware that energy is transformed with a loss of energy during each transformation. | The student will be aware of interdependence of energy use and personal comfort. | The student will be aware of various career opportunities involved in the transformation of energy from source to usable product. | The student will be aware of interdependency of energy use and personal comfort. → | The student will be aware that transformation of energy from source to usable product presents environmental and economic issues. |
| **Application** | The student will be cognizant of the forms of energy used to produce basic food groups. | The student will understand that temperatures vary over different surfaces, such as earth, plants, or fabrics. | The student will be aware of careers associated with energy transformation. | The student will relate favorite recreation activities to energy requirements of each. | The student will be able to identify uses of land and compare job opportunities and economic importance of each use. |
| **Values** | The student will understand the nutrition and energy economics of food groups. | The student will be aware of advantages and disadvantages of adjusting lifestyles to maximum energy efficiency. | The student will understand that career choices are affected by availability of energy or by alternative sources of energy. | The student will recognize personal satisfaction associated with favorite recreational activities in terms of energy cost. | The student will be aware of advantages and disadvantages of different land uses and of how the use of land affects choices people have. |

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 11.

# GRADES 6-8 ENERGY EDUCATION ACTIVITIES

## SOCIO-LEGAL AND KNOWLEDGE

THE STUDENT IS AWARE THAT TRANSFORMATION OF ENERGY FROM SOURCE TO USABLE PRODUCT PRESENTS ENVIRONMENTAL AND ECONOMIC ISSUES. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

| SUBJECT | CORRELATING ACTIVITIES |
|---|---|
| Language Arts | Students interview senior citizens and compare to the present the lifestyles and economic and environmental problems of earlier days when energy use was not as limited. Students interview senior citizens to determine what alternative energy sources were used before present-day energy sources were available. |
| Social Studies | Students investigate the environmental and economic impact on the community of the use of various types of energy. |
| Science | Students design an experiment to change energy from one form to another. |
| Health | Students compare types of current health problems of the community with health problems of earlier days when energy use was a fraction of present use. |
| Mathematics | Students plot the economic value of energy produced and the cost of dealing with environmental problems incurred. |
| Art | Students make a diorama of events in earth history that have caused resources to be concentrated in certain locations. |
| Music | Students experiment with amounts of electrical energy required to produce sounds in various instruments and in amplifier systems. |

# GRADES 9-12 MATRIX
## OBJECTIVES FOR ENERGY EDUCATION

| | Consumer | Individual Well-Being | Career | Recreational | Socio-Legal |
|---|---|---|---|---|---|
| Knowledge | The student will understand that energy conservation and alternative energy sources will affect consumer behavior. | The student will be aware of the interdependence of personal well-being and comfort and energy consumption. | The student will understand that changing patterns of energy use and alternative sources of energy affect career opportunities now and in the future. | The student will be aware of how the availability of energy and efforts to conserve will affect recreation and lifestyle. | The student will understand that improved energy conservation practices and alternative sources will cause major changes in individual lifestyle and world society. |
| Application | The student will describe an energy-efficient home, car, school, and appliance. | The student will provide examples of how group and individual well-being are improved by energy conservation in areas of transportation, housing, and recreation. | The student will identify major changes which energy conservation practices or which alternative sources of energy will have on job opportunities in the major occupational clusters. | The student will list and compare energy efficient vs. inefficient recreational activities in the areas of travel, sports, hobbies, and home care. | The student will list major changes in law or social customs which have taken place in the areas of transportation, housing, and recreation as a result of energy shortage. |
| Values | The student will list the specific advantages and disadvantages of acquiring an energy-efficient home, car, or appliance. | The student will be able to understand the effects of energy-efficient decisions related to transportation, housing, and recreation on personal comfort and well-being. | The student will list the changes which have occurred in his or her parents' careers as a result of changing energy availability or sources and how this has affected their priorities in life. | The student will identify changes which have occurred and project future changes in his or her recreation lifestyle as a result of the current energy situation. | The student will be able to compare the present and projected laws and customs in the areas of transportation, housing, and recreation as a result of energy conservation practices. |

→SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 13.

# GRADES 9-12 ENERGY EDUCATION ACTIVITIES

## INDIVIDUAL WELL-BEING AND APPLICATION

THE STUDENT WILL PROVIDE EXAMPLES OF HOW GROUP AND INDIVIDUAL WELL-BEING ARE IMPROVED BY ENERGY CONSERVATION IN AREAS OF TRANSPORTATION, HOUSING, AND RECREATION. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

| SUBJECT | CORRELATING ACTIVITIES |
|---|---|
| Language Arts and Language Learning | Students debate voluntary changes vs. governmental control as a necessity to make changes in energy consumption. |
| Social Studies | Students interview people who rode trains 30 years ago and people who have ridden trains recently and compare their experiences. Students debate the merits of mass transportation as an energy-saving method. |
| Science | Students place glass microscope slides covered with petroleum jelly in the exhaust of three different vehicles and compare the amounts of particulate matter expelled. |
| Health | Students predict the air pollution effect if no students drove cars to or from school. |
| Mathematics | Students design a scale to rate well-being of individuals riding in a vehicle and graph comparisons of different size cars. |
| Art | Students express one person's feelings about the need for energy conservation in areas of transportation, housing, and recreation. |
| Music | Students develop a rhythmic choral reading to compare the sound levels of different kinds of transportation. |

# COMPLIANCE STATEMENT

## TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) non-discrimination in extracurricular activities and the use of school facilities;

(4) non-discriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) non-discriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

## SECTION 504, REHABILITATION ACT OF 1973; EDUCATION OF THE HANDICAPPED ACT (P.L. 94-142)

No qualified handicapped person will, on the basis of handicap, be excluded from participation in, be denied the benefits of, or otherwise be subject to discrimination under any program or activity operated by the Texas Education Agency. The Texas Education Agency makes positive efforts to employ and advance in employment qualified handicapped individuals.

## TITLE IX, CIVIL RIGHTS ACT OF 1964

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